MICHIGAN WATER COLLABORATION WORKSHOP
BREAKOUT GROUP NOTES - NUTRIENT LOADING

Outline:

I. Management gaps, research needs and opportunities
II. Resources
III. Partnership brainstorm
IV. Breakout group participants

I. Management Gaps, Research Needs and Opportunities

New analyses with existing datasets

- Large monitoring MDEQ data sets that could be analyzed more, many span 15 years or more
    - 31Great Lakes tributaries
    - Connecting channels, major Great Lake embayments
    - Randomly selected inland rivers and streams (250 sites sampled over 5 years) – currently on our third 5-year cycle
    - Trophic state data from numerous inland lakes might allow further analysis of how landscape characteristics (e.g. land use, watershed size) influence lake trophic state
- Inland lake and shoreline development questions, e.g., how does shoreline hardening affect nutrient inputs and cycling? Limited information about shoreline status exists.
- Database development and big data analytics are challenging, and new innovations could be helpful.
- Datasets can be used to identify locations and topics for additional research

Sensor technologies, BMP assessments

- Independent verification of technologies, such as monitoring equipment and municipal BMPs. Suppliers could be source of support for academic research.
- More research on what outcomes could be expected from green infrastructure. For example, potential for greater use of constructed wetlands for water quality functions, but need more demonstration projects
- More measurements of "first flush" of run-off after rain events. Potential for greater use of in situ, continuous monitoring technologies. CILER has been testing tools that can do hourly measurements of DRP.
- More edge of field studies. More research and deployment of tile drain management technologies, could be paired with new WQ monitoring technologies.

Emerging and on-going research needs

- Opportunities for academics to address issues beyond state programs, e.g., large geographic scope, water quality parameters not easily measured.
- Lake Erie algal bloom questions
- Many requests to investigate inland lake nutrient and algae issues, need to assess nutrient budget and the degree to which external loading is a driver.
- Assistance with numeric nutrient criteria, development of process and baseline analyses to be prepared to develop standards if/when needed.
- Greater understanding of loadings and algal blooms in different systems.
- N vs. DRP vs. TP. More attention needed on the drivers, concentrations and impacts of nitrogen, TP and DRP in lakes, wetlands and tributaries. For example, coastal wetlands appear to be N limited.
- Ways to help communities understand value and functions provided by their natural assets. Look for ways to partner with communities on projects.
- Climate change effects on nutrient loading into surface waters

II. Resources

- People – University students, agency staff can commit time to projects that are mutually beneficial.
- State Labs - DEQ and state contracted labs have a lot of capacity and can be used for additional projects, though there are costs. State labs routinely measure nutrients, metals, organics. Not well equipped for emerging contaminants.
- Academic Labs – can be used for emerging contaminants, isotopes, genetics or other new analyses.
- Sensors – CILER has been testing new in situ nutrient sensors for continuous measurements. David has a new handheld sensor to pilot this summer.
- Field equipment – DEQ has a number of samplers that can be deployed in different ways depending on needs.
- Relationships – State and universities will have a different suite of valuable connections.
    - Landowners, communities – These can be key for selecting locations and partners for projects, BMP assessment etc.
    - Potential partners, funders, including non-traditional sources of funding or local champions.
    - Suppliers can be a source of support or free field equipment or lab gear for testing.
- Tools – Academic partners (such as MSU- IWR) have a variety of tools related to erosion, nutrient models, cloud computing, big data, data visualization.
- Data – DEQ and other state agencies have many datasets and databases that can be analyzed in new ways or used to guide further research. For example:

- Remote sensing data (1999-2014)
- Water quality monitoring

III. Partnership Brainstorm

In the last few minutes of our breakout group, we brainstormed around one partnership idea.
Gap: Desire to enhance analyses of existing datasets to better understand patterns and drivers of water quality in Michigan waters.

Opportunity:

- Universities and tech companies are developing new ways to analyze big data sets, e.g., machine learning, cloud computing, visualization tools
- MSU's Institute for Water Resources has developed a number of decision support tools and has a new grant to explore machine learning techniques. The focus and pilot datasets are not fully defined yet. (Jeremiah can explain more.)
- MDEQ and others have an array of data that could be integrated and analyzed through machine learning or other approaches. This includes:
    - Landscape and climate variables
    - Water quality parameters
    - Watershed and shoreline characteristics
    - Algal blooms (less availability through state)
    - Other citizen science efforts (MiCorps)
    - Biological data (DNR – primarily fish data; DEQ – primarily benthic macroinvertebrate community data, limited fish data)

Applications:

- New data analytics could address a number of watershed management and planning questions, including:
    - What BMPs to select and where to place them to maximize benefits, e.g., cover crops or constructed wetlands
    - Relative contribution of different sources for pollutants
    - Where to focus additional monitoring
    - Development of watershed management plans (Peter can explain further.)
- Can new analytics help visualize watershed issues and build community understanding and local support? Desire to show how citizen science efforts are being used.

IV. Breakout Group Participants

Christe	Alwin	MDEQ	alwinc@michigan.gov
Jeremiah	Asher	MSU	asherjer@msu.edu
John	Farrelly	MDEQ	FarrellyJ1@michigan.gov

Anne	Garwood	MDEQ	garwooda@michigan.gov
Thomas	Johengen	U-M CILER	johengen@umich.edu
David	Karpovich	SVSU	dsk@svsu.edu
Joseph	Kelpinski	MDARD	kelpinskij@michigan.gov
Dina	Klemans	MDEQ	klemansd@michigan.gov
Gary	Kohlhepp	MDEQ	kohlheppg@michigan.gov
Alyssa	Riley	MDEQ	rileya3@michigan.gov
Don	Uzarski	CMU	uzars1dg@cmich.edu
Lynn	Vaccaro	U. Mich	Lvaccaro@umich.edu
Peter	Vincent	MDEQ	vincentp@michigan.gov